

STATE OF SOUTH CAROLINA

Application of

Duke Energy Carolinas, LLC
for Approval of Energy Efficiency Plan Including
an Energy Efficiency Rider and Portfolio of Energy
Efficiency Programs.

BEFORE THE
PUBLIC SERVICE COMMISSION
OF SOUTH CAROLINA

COVER SHEET

DOCKET
NUMBER: 2007-358-E

(Please type or print)

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DOCKETING INFORMATION (Check all that apply)

☐ Emergency Relief demanded in petition ☐ Request for item to be placed on Commission's Agenda expeditiously

☒ Other: _____

INDUSTRY (Check one)	NATURE OF ACTION (Check all that apply)			
<input checked="" type="checkbox"/> Electric	<input type="checkbox"/> Affidavit	<input type="checkbox"/> Letter	<input type="checkbox"/> Request	
<input type="checkbox"/> Electric/Gas	<input type="checkbox"/> Agreement	<input type="checkbox"/> Memorandum	<input type="checkbox"/> Request for Certificatio	
<input type="checkbox"/> Electric/Telecommunications	<input type="checkbox"/> Answer	<input checked="" type="checkbox"/> Motion	<input type="checkbox"/> Request for Investigator	
<input type="checkbox"/> Electric/Water	<input type="checkbox"/> Appellate Review	<input type="checkbox"/> Objection	<input type="checkbox"/> Resale Agreement	
<input type="checkbox"/> Electric/Water/Telecom.	<input type="checkbox"/> Application	<input type="checkbox"/> Petition	<input type="checkbox"/> Resale Amendment	
<input type="checkbox"/> Electric/Water/Sewer	<input type="checkbox"/> Brief	<input type="checkbox"/> Petition for Reconsideration	<input type="checkbox"/> Reservation Letter	
<input type="checkbox"/> Gas	<input type="checkbox"/> Certificate	<input type="checkbox"/> Petition for Rulemaking	<input type="checkbox"/> Response	
<input type="checkbox"/> Railroad	<input type="checkbox"/> Comments	<input type="checkbox"/> Petition for Rule to Show Cause	<input type="checkbox"/> Response to Discovery	
<input type="checkbox"/> Sewer	<input type="checkbox"/> Complaint	<input type="checkbox"/> Petition to Intervene	<input type="checkbox"/> Return to Petition	
<input type="checkbox"/> Telecommunications	<input type="checkbox"/> Consent Order	<input type="checkbox"/> Petition to Intervene Out of Time	<input type="checkbox"/> Stipulation	
<input type="checkbox"/> Transportation	<input type="checkbox"/> Discovery	<input type="checkbox"/> Prefiled Testimony	<input type="checkbox"/> Subpoena	
<input type="checkbox"/> Water	<input type="checkbox"/> Exhibit	<input type="checkbox"/> Promotion	<input type="checkbox"/> Tariff	
<input type="checkbox"/> Water/Sewer	<input type="checkbox"/> Expedited Consideration	<input type="checkbox"/> Proposed Order	<input checked="" type="checkbox"/> Other: Testimony of Nick Hall	
<input type="checkbox"/> Administrative Matter	<input type="checkbox"/> Interconnection Agreement	<input type="checkbox"/> Protest		
<input type="checkbox"/> Other:	<input type="checkbox"/> Interconnection Amendment	<input type="checkbox"/> Publisher's Affidavit		
	<input type="checkbox"/> Late-Filed Exhibit	<input type="checkbox"/> Report		

BEFORE
THE PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA

DOCKET NO. 2007- 358 - E

In re:)	
Application of Duke Energy Carolinas, LLC)	TESTIMONY OF
For Approval of Energy Efficiency Plan)	NICK HALL FOR
Including an Energy Efficiency Rider and)	DUKE ENERGY CAROLINAS
Portfolio of Energy Efficiency Programs)	

This document is an exact duplicate, with the exception of the form of the signature, of the e-filed copy submitted to the Commission in accordance with its electronic filing instructions.

I. INTRODUCTION AND PURPOSE

1 **Q. PLEASE STATE YOUR NAME, TITLE AND BUSINESS ADDRESSES.**

2 A. My name is Nick Hall. I am the President and owner of TecMarket Works. My
3 office is located in the TecMarket Works business center, 165 West Netherwood
4 Road, Suite A, 2nd Floor, Oregon, Wisconsin.

5 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

6 A. TecMarket Works is an independently owned, operated, and managed business
7 providing energy efficiency program evaluation services to governments,
8 regulatory agencies, and utility companies. Our primary markets are located in
9 the United States and Canada. In this capacity I am responsible for all aspects of
10 our business operations.

11 **Q. PLEASE BRIEFLY DESCRIBE YOUR DUTIES AND**
12 **RESPONSIBILITIES AS THE PRESIDENT OF TECMARKET WORKS.**

13 A. My primary responsibility is to assure that our firm provides accurate, reliable,
14 independent evaluation services for our clients for which energy efficiency,
15 energy supply, and environmental-related policy and program decisions can be
16 grounded. In this capacity we direct, manage, design, conduct, supervise, and
17 provide oversight responsibilities for a wide range of energy efficiency and
18 demand reduction program evaluations covering hundreds of different types of
19 programs serving all customer markets.

20 **Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL BACKGROUND**
21 **AND BUSINESS EXPERIENCE.**

1 A. Upon graduation from high school, I was recruited by the National Security
2 Agency to train as a crypto analyst working to decode top secret Soviet, Chinese,
3 and North Vietnamese military communications. After serving in this capacity
4 for four years, I obtained my undergraduate and graduate degrees from Sangamon
5 State University in Springfield, Illinois (now the University of Illinois). My
6 undergraduate degree is in Biology and I hold a Masters degree in Environmental
7 Administration. In the 1970s, I was employed as an aquatic research analyst for
8 the Illinois Natural History Survey, and as a chemist for the Illinois Department of
9 Transportation. In 1978, shortly after the United States Department of Energy
10 ("USDOE") was formed, I was employed by the Illinois Department of
11 Administration as an energy efficiency product/program analyst conducting
12 evaluation studies regarding which products, programs, and services provided the
13 greatest energy savings. In 1982, I was recognized by the USDOE and referred to
14 Congress and the President as having the most innovative evaluation practice in
15 the United States. In that same year, I transferred to the Illinois Department of
16 Energy and Natural Resource where I served as a Program Evaluation
17 Professional, evaluating the efficiency and effectiveness of publicly-funded
18 energy efficiency programs for USDOE and the State of Illinois. I served in this
19 capacity until 1992 when I joined the energy consulting firm of Hagler Bailly,
20 directing and conducting all energy efficiency evaluation research for
21 Wisconsin's utility-funded demand side management programs. In 1994 I formed
22 TecMarket Works for the purpose of conducting energy efficiency evaluations
23 and research for governments, utilities, and collaborative energy efficiency

1 organizations. At last count, I have authored over 260 studies and research
2 publications, presented in numerous energy efficiency evaluation conferences and
3 association meetings, and have directed, conducted, or supervised approximately
4 \$200 million worth of energy efficiency program evaluation studies, independent
5 audits, and consulting activities. My recent efforts include the development and
6 co-authoring of the California Evaluation Framework, the California Evaluation
7 Protocols, and the oversight, management, and supervision of the evaluation
8 efforts for \$2.5 billion dollars reflected in the current California Energy
9 Efficiency programs, with an evaluation budget of \$170 million. In addition, I am
10 leading the restructuring of the national evaluation efforts for over 300 programs
11 for USDOE, and will be directing these studies. I am also on the National Energy
12 Plan's sub-committee to develop the evaluation protocols to help support the
13 greenhouse gas reduction achievements for programs evaluated under this
14 protocol. Finally, I am also on the Wisconsin Governor's Task Force Energy
15 Efficiency Program Sub-committee which is tasked with recommending funding
16 levels and evaluation approaches for Wisconsin's efforts to reduce greenhouse gas
17 emissions.

18 **Q. ARE YOU A MEMBER OF ANY PROFESSIONAL ORGANIZATIONS?**

19 A. Yes, I am a member of the International Energy Program Evaluation Conference
20 ("IEPEC"), a non-profit energy efficiency program evaluation educational
21 organization. I have served as a past President, a past Treasure, a past Board
22 Member, Planning Committee Member, and the Legal Corporate Agent since I
23 founded the organization in 1982. I continue to serve in this organization as the

1 Legal Corporate Agent and as a Planning Committee member. I am also a
2 member of the Association of Energy Service Professionals ("AESP"), where I
3 have served as the Chairman of the Evaluation Committee. I also co-founded the
4 Illinois Evaluation Association, but I am no longer a practicing member. I have
5 been honored by the Lifetime Achievement Award from the IEPEC and the
6 Outstanding Achievements Award by the AESP. Both of these awards are
7 provided as a result of peer voting within the energy services community. I am
8 honored to be the only individual to have received both of these industry awards.

9 **Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY BEFORE ANY**
10 **REGULATORY AGENCIES?**

11 A. Yes. I have testified in California and Wisconsin, and have been requested to
12 present opinions and study results to regulatory agencies in California, Wisconsin,
13 Vermont, Missouri, Ohio, Kentucky, Minnesota, Oregon, and Washington.

14 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
15 **PROCEEDING?**

16 A. My testimony pertains to the program evaluation proposals and analysis filed by
17 Duke Energy Carolinas, LLC ("Duke Energy Carolinas" or the "Company") for
18 its "save-a-watt" energy efficiency and demand reduction programs¹.

19 **II. ENERGY EFFICIENCY PROGRAM EVALUATION PLANS**

20 **Q. HAVE YOU REVIEWED THE SUMMARY PROGRAM EVALUATION**
21 **PLANS FILED BY DUKE ENERGY CAROLINAS AS THEY APPLY TO**
22 **EVALUATION, MEASUREMENT AND VERIFICATION?**

¹ The term "energy efficiency," as used in my testimony, includes both energy efficiency/conservation and demand response measures.

1 A. Yes. I have examined all of the summary program evaluation proposals for Duke
2 Energy Carolinas' proposed energy efficiency programs attached to the testimony
3 of Dr. Stevie as Stevie Exhibit No. 3.

4 **Q. WHAT IS YOUR PROFESSIONAL OPINION OF DUKE ENERGY**
5 **CAROLINAS' OVERALL APPROACH TO THE ENERGY EFFICIENCY**
6 **PROGRAM EVALUATIONS?**

7 A. First, Duke Energy Carolinas has adequately provided for the independent review
8 and evaluation of its proposed programs by establishing initial evaluation plan
9 summaries that propose specific energy efficiency evaluation studies and
10 activities, which will be competitively bid, designed, managed, supervised, or
11 conducted by independent and qualified evaluation professionals. Energy
12 efficiency evaluation requires significant scope and breadth of skills and
13 experience, including statistical, engineering, financial, and project management,
14 and thus using subject matter experts within the energy evaluation field is a
15 prudent strategy. Second, I regard this approach as being a reliable approach
16 because it moves the evaluation function that documents the amount of energy
17 saved, or how effective a program design or delivery system may be, outside of
18 the company that has a vested interest in the outcome of the studies. The
19 professional evaluation industry is established in order to provide objective,
20 reliable evaluation results on which public policy can be effectively grounded and
21 on which cost recovery, lost revenue recovery, and incentive approaches can be
22 based. I am also of the opinion that establishing a system in which the functional
23 separation within the utility between program implementers and evaluation

1 analysts has also led to reasonable checks and balances on program reporting.
2 And as I understand, Duke Energy Carolinas has this type of functional separation
3 already in place. This serves to strengthen the extent to which unbiased and
4 accurate program reporting occurs. Third, by specifying proposed evaluation
5 activities in advance of program initiation, Duke Energy Carolinas is better able
6 to collect the necessary data required for quality evaluations to be conducted.
7 Customer surveys, load research metering, vendor management systems, and
8 other actions taken early during program roll out tend to mitigate surprises at year
9 end when full scale evaluation reports are completed. Early diagnostics often
10 permit quick and easy adjustments to programs such that long run effectiveness is
11 maximized. In my opinion, Duke Energy Carolinas' desire to establish
12 independent evaluations from qualified third parties indicates that the Company is
13 focused on establishing an evaluation/auditing function geared to provide accurate
14 and reliable energy savings estimates and program effectiveness feedback.

15 **Q. ARE DUKE ENERGY CAROLINAS' ENERGY EFFICIENCY PROGRAM**
16 **EVALUATION SUMMARIES CONSISTENT WITH STATE-OF-THE-**
17 **ART EVALUATION PROTOCOLS?**

18 **A.** Yes. As the primary author of the California Evaluation Framework, and the
19 California Evaluation Protocols, and as one of the members of the evaluation
20 protocol committee of the National Action Plan for Energy Efficiency, I am very
21 familiar with the content and approach of the current protocols and in the
22 approaches presented in these documents. Additionally, I am very familiar with
23 the International Performance Measurement and Verification Protocol ("IPMVP")

1 and have directed over 200 studies employing these protocols since 2002, and I
2 have incorporated the IPMVP approach in the California Energy Program
3 Evaluation Protocols. Duke Energy Carolinas' energy efficiency summary
4 program evaluation plans employ the kinds of evaluation efforts, studies, and
5 activities that are associated with the state-of-the-art evaluation research and do
6 comply with the approaches described in the California Evaluation Protocols, the
7 National Action Plan for Energy Efficiency approaches and the IPMVP
8 approaches. The results from studies conducted by the approaches presented in
9 Duke Energy Carolinas' save-a-watt programs will be reliable and can be trusted
10 if the evaluations are conducted in accordance with these approaches.

11 **Q. YOU MENTIONED THE CALIFORNIA EVALUATION PROTOCOLS.**
12 **PLEASE DESCRIBE IN GREATER DETAIL HOW THAT APPROACH IS**
13 **SIMILAR TO OR DIFFERENT THAN DUKE ENERGY CAROLINA'S**
14 **ENERGY EFFICIENCY PLAN.**

15 A. The California Evaluation Protocols represent a set of evaluation approaches that
16 can be used for almost any kind of energy efficiency program evaluation. They
17 were written for California's portfolio of over 250 programs, and therefore, had to
18 be comprehensive and cover a wide variety of programs. They also had to be
19 based on reliable state-of-the-art approaches and employ procedures that allow for
20 site-specific data collection to confirm installations, baseline conditions, use
21 conditions, and operational environments. From this perspective Duke Energy
22 Carolinas' approach is similar in that the evaluations are structured at the program
23 level and are designed to focus the evaluation on achieved savings. The

1 evaluation approaches to be conducted on the Duke Energy Carolinas' programs
2 are consistent with the same type of approaches that we use in California, where
3 the results of the studies are used to update deemed savings databases and feed
4 future energy program planning processes. With this said, it is also important to
5 know that the evaluation funding levels used in California are set at 8 percent of
6 the implementation budget. Although most all other states set their evaluation
7 budgets at levels lower than California, the approaches that are used (such as
8 those planned by the Company) represent similar approaches implemented at a
9 level that reflects the available evaluation budget. The evaluation budget
10 typically applied in other states range between 3% and 5% of the program
11 implementation budgets. In California we went from 4% to 8% because the
12 CPUC found that the evaluations conducted under the 4% budget were not
13 reliable enough. The CPUC requested protocols and approaches that were more
14 reliable so that the results could be used for resource planning support. This often
15 means that although the approach is the same, there may be a need to adjust the
16 evaluation sample sizes or data collection approach to meet the available
17 evaluation funding and the need for higher or lower rigor within specific studies.
18 For example, in California we use risk analysis software to identify evaluation
19 rigor levels and fund studies based on the risks associated with the individual
20 program's ability to reach their energy saving goals as a proportion of the goals of
21 the portfolio. This way the high-risk, high-energy saving programs receive the
22 more rigorous and more expensive evaluations. However, the overall evaluation
23 approach proposed by Duke Energy Carolinas is established using the same type

1 of evaluation approaches we use in California. That is, the evaluations are based
2 not only on engineering projections of savings, but on actual field evaluation
3 metering, monitoring, measurement, and verification efforts focused on
4 identifying the savings that are being achieved by the measures installed as a
5 result of the program, taking into account the use conditions associated with the
6 measures installed.

7 **Q. IS DUKE ENERGY CAROLINAS' ENERGY EFFICIENCY PLAN FOR**
8 **VERIFICATION OF INSTALLED MEASURES ADEQUATE?**

9 A. Most experienced program designers and managers know it is important to confirm
10 that what is being claimed by a program is actually what is being installed, and
11 that a program is operating in accordance with the conditions on which the
12 predicted savings can be achieved. Duke Energy Carolinas proposes to verify,
13 generally, 5 percent of the installed measures, focusing on the high savings, high
14 priority measures more so than the low savings programs or programs with a low
15 number of installed measures. In my opinion verification efforts should be
16 tailored to achieve cost-effective program operations, but should be set high
17 enough to make sure program claims are valid. Most programs with which I am
18 familiar across the country set their verification levels from zero percent (no
19 verification) to a high of 10 percent of installed measures. I think that the 5
20 percent number is adequate for the initial year of implementation for verification
21 with the condition that if and when a problem with the accuracy of the
22 installations is identified, there should be increased verification for that program
23 to confirm that any installation or accounting issues have been corrected. That

1 said, there will be cases such as compact fluorescent bulb promotions where a 5%
2 verification rate may be too much. Where thousands of measures are being
3 deployed, verification tracking at the 1% or 2% level is often sufficient in light of
4 the cost/precision tradeoff that occurs with larger sample sizes. I have reviewed,
5 for example Stevie Exhibit No. 3 to Dr. Stevie's testimony, which describes Duke
6 Energy Carolinas' measurement and verification approach for its proposed
7 programs. I agree with the Company's approach. It is important to keep in mind
8 that in addition to the Company's own verification efforts, the independent
9 evaluation efforts will be conducting on-site metering, monitoring and verification
10 (M&V) efforts to support the evaluation efforts. In some cases, these samples can
11 serve to supplement verification samples.

12 **Q. IN REVIEWING DUKE ENERGY CAROLINAS' ENERGY EFFICIENCY**
13 **PROGRAM SUMMARY EVALUATION PLANS DO YOU SEE ANY**
14 **SPECIFIC PROGRAMS THAT HAVE PROPOSED EVALUATION**
15 **APPROACHES THAT YOU THINK WILL IMPACT THE RELIABILITY**
16 **OF THE SAVINGS ESTIMATES?**

17 **A.** First, let me again say that Duke Energy Carolinas' summary evaluation plans
18 reflect the state-of-the-art approaches and plans within the energy program
19 evaluation field. The summary plans reflect careful attention not only to the
20 program being evaluated but to the kinds of technologies and applications being
21 applied. The summary plans provide the framework under which the evaluation
22 will be conducted. From this perspective the potential for reliable savings
23 estimates is very strong. However, the reliability of the savings estimates is more

1 of a function of the results of the first wave of evaluation report findings. There is
2 no way to judge the expected variance of the energy savings estimates without an
3 initial set of evaluation findings. After the first year of evaluation activity, Duke
4 Energy Carolinas will be in a position to begin to judge the relative reliability and
5 precision of the energy savings estimates; but without direct evaluation findings
6 within South Carolina for these programs, such a quantitative forecast is difficult,
7 if not impossible, to assess. In my experience, the greatest threat to the reliability
8 of the evaluation results is often due to evaluation budgets being set too low to
9 establish reliable evaluation approaches. I believe Duke Energy Carolinas'
10 proposal to initially budget approximately 5% of program costs for measurement
11 and verification should result in reliable evaluation results if the studies are well
12 designed and targeted, as discussed more fully below.

13 **Q. WHAT IS YOUR OPINION OF THE PROPOSED EVALUATION**
14 **BUDGET AND ITS EFFECT ON THE RELIABILITY OF THE SAVING**
15 **ESTIMATES FROM THE EVALUATION EFFORT?**

16 **A.** Within California, we have debated this issue quite a bit with respect to the 700
17 evaluations we have directed or overseen for the State since 2002. From 2002-
18 2005 the California evaluation budget was set at about 4 percent of the program
19 funds. For many programs, especially the larger programs, this funding level was
20 adequate to produce reliable estimates. However, for the smaller programs with
21 funding levels under \$3-5 million the evaluation budgets began to erode the
22 reliability of the evaluation findings. Currently, we are projecting to spend about
23 8 percent on evaluation activity in 2008. With a 5 percent evaluation budget it

1 will be important to allocate evaluation dollars to the most important programs,
2 leverage assets already within Duke Energy Carolinas (e.g., meters, expertise,
3 data systems) and focus on the most important technologies so the programs that
4 provide the highest savings, or uncertainty in savings, receive the funding that
5 allows those saving estimates to be accurate. For smaller programs, or for
6 programs that provide smaller savings levels, the evaluation funding may need to
7 be less than 5 percent. The reason that the California Public Utilities Commission
8 has increased the evaluation funding level to 8 percent has been specifically
9 directed toward an effort to increase the reliability of the study results. An
10 evaluation budget between 5 and 10 percent should be adequate to obtain reliable
11 evaluation results for programs that represent the majority of the savings
12 contributions. I think the 5 percent level is a reasonable place to start, but some
13 option to raise this level quickly if necessary would also be a prudent strategy.
14 The key to reliable savings estimates rests with applying a research protocol that
15 is objective and is consistent with the need for accurate measurements. The
16 IPMVP and protocols such as the California Protocol, when effectively applied,
17 will provide reliable energy savings estimates. Duke Energy Carolinas' proposed
18 evaluation efforts and segregation plans are consistent with these protocols.

19 **Q. DO YOU HAVE AN OPINION OF DUKE ENERGY CAROLINAS'**
20 **EVALUATION REPORTING TIMELINE? IS IT REASONABLE AND**
21 **ACHIEVEABLE?**

22 **A.** The evaluation reporting timeline proposed by Duke Energy Carolinas and further
23 discussed in Dr. Stevie's testimony is both reasonable and achievable. The

1 evaluation planning process is to be achieved after the programs are up and
2 running. However, some of the evaluation's data collection and reporting may
3 well provide early and important diagnostics to program managers in advance of
4 this schedule, in all likelihood. But generally, this schedule allows enough time
5 for the programs to become operational and embedded in the market. This is
6 important because the evaluation needs to be based on the programs as fielded
7 rather than the programs as designed. It is important to give the program time to
8 come up to full implementation speed before a full scale evaluation effort is
9 initiated. The impact evaluations often need to occur a year or more after enough
10 installations have occurred to allow the study enough consumption data to reliably
11 estimate the difference between the pre-program and post-program conditions.
12 The timelines proposed by Duke Energy Carolinas for evaluation reports are
13 reasonable.

14 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

15 **A. Yes.**

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In Re:

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CERTIFICATE OF SERVICE

This is to certify that I, Leslie L. Allen, a legal assistant with the law firm of Robinson, McFadden & Moore, P.C., have this day caused to be served upon the person(s) named below the **Testimony of Nick Hall** in the foregoing matter by placing a copy of same in the United States Mail, postage prepaid, in an envelope addressed as follows:

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Dated at Columbia, South Carolina this 10th day of December, 2007.

A handwritten signature in cursive script, reading "Leslie Allen", written in black ink. The signature is positioned above a horizontal line.

Leslie L. Allen